Systemic Implications of Financial Inclusion

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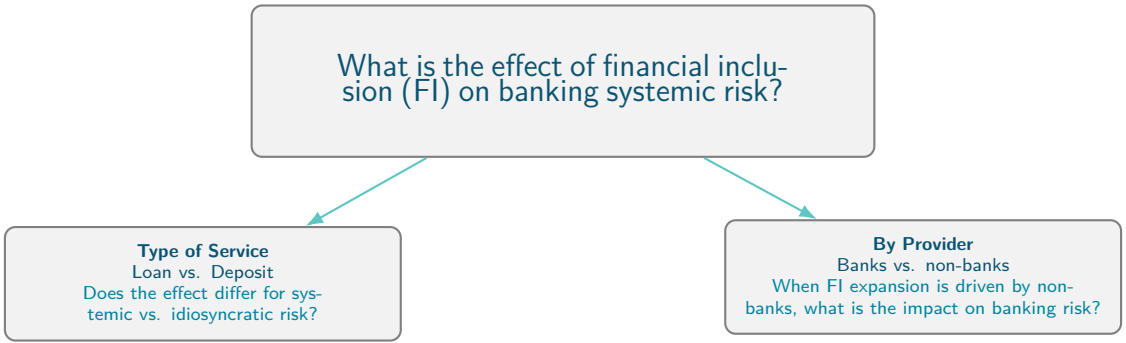
Outline

Introduction

Motivation



Policy Implication:

Does prudential regulation turn financial inclusion into a source of stability—or intensify risks through competitive pressures?

Conceptual Framework

- Literature on FI - FS nexus focused on bank idiosyncratic risk (Z-Scores) Čihák et al. (2021),
  - ✓ Deposit inclusion: Low-income savers provide stable deposits in crises, Ahamed and Mallick (2019),
  - ✗ Loan inclusion: competitive system → relaxed lending standards Feghali et al. (2021),
  - ✓ Loan inclusion → diversification loan portfolio, *Dev*, López and Winkler (2019),
- **FI** & **systemic risk**: FI may reduce systemic risk conditional on greater diversification in lending and in the allocation of additional deposit-driven funds. Beck et al. (2013), ↑ diversification ↓ tail dependency (LRMES),
- Non-banks increase competitive pressure on banks:
  - Relaxed credit standards, Darst et al. (2020).
  - Riskier investments, Agénor and Bayraktar (2023).
- Macroprudential regulation can limit excessive risk-taking as FI expands (Wang and Luo, 2022)
- But may also lead to regulatory arbitrage, fostering the entry of less regulated financial institutions (Claessens et al., 2021; Irani et al., 2021).

Methodology

Financial Inclusion

Definition: *access to and use of formal financial services Čihák et al. (2016)*

- FAS (yearly) widely used in FI- FS literature (López and Winkler, 2019) | WBGF (demand-side questions),
- **FI** proxied with (Ahamed and Mallick, 2019, Danisman and Demirel, 2019, Wang and Luo, 2022):
  1. i) depositors | borrowers per adults: may overstate inclusion (being a borrower doesn't ensure regular borrowing)
  2. ii) loans | deposits to GDP: mask concentration
- We also consider the share of non-banks (NCB)[1] in loan and deposit services.

[1] Credit unions, microfinance institutions, savings and loan associations, and money market funds

Systemic & Idiosyncratic Risks

Systemic Risk

- Definition: *Widespread failures of financial institutions that impair financial intermediation, payments and lending*, Rochet and Tirole (1996),
- Contagion due to interconnectedness, share risk exposures, Acharya et al. (2017)
- *SRISK* (Brownlees and Engle, 2017): contribution to undercapitalization of the financial system in times of distress

$$SRISK_{i,t} = kD_{i,t} - (1-k)W_{i,t}(1 - LRMES_{i,t})$$

Where:

  - $D_{i,t}$: debt, $W_{i,t}$: market value of equity, $LRMES_{i,t}$: expected equity loss conditional on a 40% market decline, k: capital ratio.

- Data source: V-Lab, NYU Stern.

Systemic & idiosyncratic risks

Idiosyncratic Risk

- **Z-Score**: proxy of individual risk-taking behavior
- Commonly used in literature FI-Financial Stability Ahamed and Mallick (2019)
  - Number of standard deviations ROA can fall before insolvency.

$$Z_{i,t} = (-1) \times \frac{ROA_{i,t} + EQA_{i,t}}{\sigma(ROA_{i,t})}$$

  - $ROA_{i,t}$: Return on assets, $EQA_{i,t}$: Equity-to-asset ratio, $\sigma(ROA_{i,t})$: Standard deviation of ROA (3-year rolling window).
- **CDS Spreads**: market perceptions of banks' risks exposures
  - Idiosyncratic component extracted using PCA, Giglio (2016).
  - First principal component (CDS - country level stock market volatility), total variation: 60.5%,
  - Residuals reflect firm-specific risk.
- Data source: Bloomberg.

Prudential Responses to Financial Inclusion

Systemic Resilience

- Macroprudential policies limit systemic risk buildup,
- **MPP** - iMaPP - capital measures (e.g., CCyB, conservation, leverage and liquidity requirements),
- Regulators integrate not only the prevailing banking conditions, but credit expansion into their decision-making processes, Alam et al. (2019),
- **MPP.Cred**: cumulative macroprudential tightening in response to FI (credit expansions, Cred[2]).

Individual Bank Resilience:

- Compliance to Basel scores mitigate individual banks' risk-taking incentives BIS (2022).
- **Mic** - Bloomberg - deviation from min ratios: leverage, Tier 1, liquidity coverage, NSFR,
- Individual banks response to FI by either strengthen resilience or loosen standards to expand market share, Sahay et al. (2015),
- **Mic.Cred**: cumulative changes in banks' Basel compliance in response to credit expansions.

[2]Cred: deviation from long term credit (CB+NCB).

Estimation Strategy

$$y_{i,j,t} = \alpha y_{i,j,t-1} + \beta_1 FI_{j,t-1} + \beta_2 (FI_{j,t-1} \times dev_j) + \gamma Bank_{i,j,t-1} + \rho Macro_{j,t-1} + \delta_1 Reg_{j,t} + \delta_2 RegCred_{j,t-1} + \mu_i + \lambda_t + \epsilon_{i,j,t} \quad (1)$$

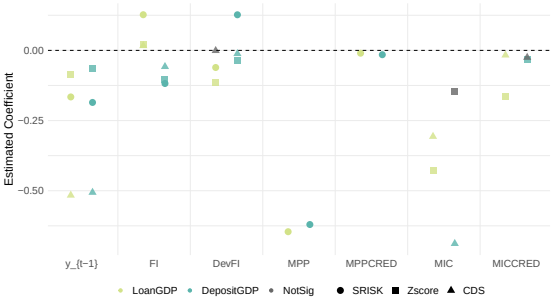
- Panel: 574 commercial banks (i) across 31 countries (j), 2009–2021,
- $y_{i,j,t}$: SRISK, Z-Score, CDS (ind).
- $FI_{j,t-1}$: FI indicators | dev_j - developing and emerging economies (12/31),
- $Bank_{i,j,t-1}$: size, ROA, equity-to-assets,
- $Macro_{j,t-1}$: GDP, stock market volatility (SV), net equity inflows (CF), deposit rates (int),
- $Reg_{j,t}$: MPP and Mic | $RegCred_{j,t-1}$: interaction with credit expansions,
- μ_i bank and λ_t time fixed effects,
- Difference GMM Arellano and Bond (1991)[3],
- Endogenous: $MPP_{j,t}$, $MIC_{j,t}$ Altunbas et al. (2018).

[3] Holtz-Eakin et al. (1988) first differences of endog variables instrumented by their lagged levels. **Validation tests**: i) Hansen (1982) overidentifying restrictions → optimal lag 3, ii) VIF → no multicolinearity, iii) Arellano and Bond (1991) → no autocorrelation in $\epsilon_{i,j,t}$.

Results

FI & Banking Risks

Figure 1: Loans and Deposits to GDP

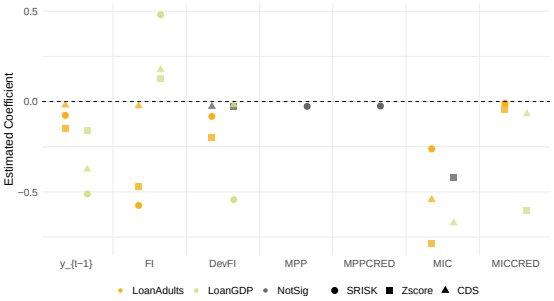


Note: Significance level p< 0.1. Control variables omitted for simplicity. Min obs: 329,359. Hansen test (min p-value = 0.14); all Wald tests (slope, time, joint) significant; Arellano–Bond test (min p-value = 0.54).

- Loan services expansions are associated with higher banking risks; deposit mitigates them.
- In *dev* countries: loan expansions further decreases banking risks due to diversification (low-income clients, Demirgüç-Kunt et al., 2020).
- However, deposits increase SRISK, associated to weaker asset diversification in *dev* (Gennaioli et al., 2018).
- Tighter MPP and higher Basel scores reduce risks (see Fig 7 and 8).
- Synchronized FI - MPP | Basel compliance, further decrease risks.

Inclusive vs. Concentrated [4]

Figure 2: Loan to GDP vs Loans per adults



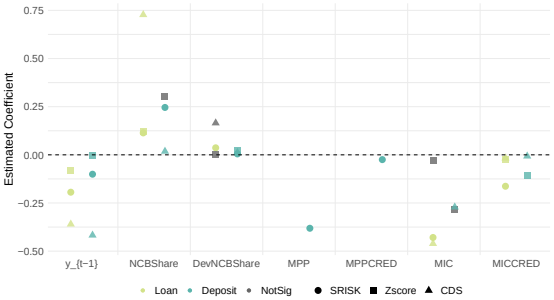
Note: Significance level p< 0.1. Control variables omitted for simplicity. Min obs: 161,385. Hansen test (min p-value = 0.17); all Wald tests (slope, time, joint) significant; Arellano–Bond test (min p-value = 0.55).

- **SRISK decreases with loan expansions per adults**, FI metric capturing loan diversification, (Beck et al., 2013),
- Loan expansions to GDP, possibly masking concentration of loans, (Čihák et al., 2021),
- Same effect for individual risks.

[4] Results vary slightly from Fig 1 due to the restricted sample (13 countries with loan per adults data). Despite changes in magnitude, coefficient signs remain consistent.

The effect of NCB on Banking Risks

Figure 3: Share of NCB



Note: Significance level p< 0.1. Control variables omitted for simplicity. Min obs: 329,352. Hansen test (min p-value = 0.32); all Wald tests (slope, time, joint) significant; Arellano–Bond test (min p-value = 0.38).

- Increased market share of NCB in loans and deposit services is associated with higher banking risks.

Conclusion

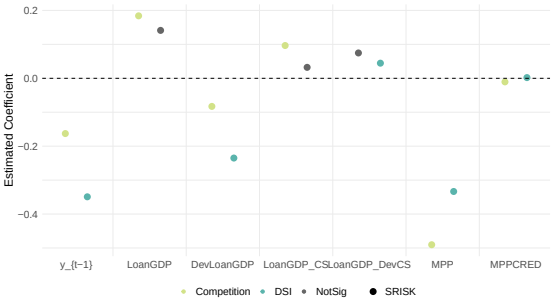
Conclusion

- **Same effect** for systemic and idiosyncratic risks
  - Credit inclusion (loans per adult) lowers all type of risks,
  - Credit inclusion (loan-to-GDP) increase all type of risks,
- **Different effect** for systemic and idiosyncratic risks,
  - Deposit inclusion reduces all type of risks;
    - SRISK: diluted in developing countries (limited opportunities for asset diversification),
- Competition through the increased market share of non-banks increases all types of risk,
- Synchronized macroprudential policies and Basel compliance with credit developments further foster financial stability.

Thank you!

When Do Credit Expansions Become Risky in Dev?

Figure 4: Loan to GDP Interacted with Competition and DSI



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- We found that Loan-to-GDP expansions increase SRISK | in *Dev* partially diluted,
- Expanding credit does not necessarily mean overlending or looser credit standards, but just inclusion of underserved individuals,
- We interact Loan-to-GDP expansions with (CS):
  1. Debt service to income (OECD),
  2. Competition (-1 x 3-bank asset concentration index, WB)[a].
- When credit expansions are accompanied by looser CS or overlending, SRISK increases,
- The effect is also amplified in *Dev*.

[a] A more competitive financial system tends to be associated with looser credit standards, Feghali et al. (2021).

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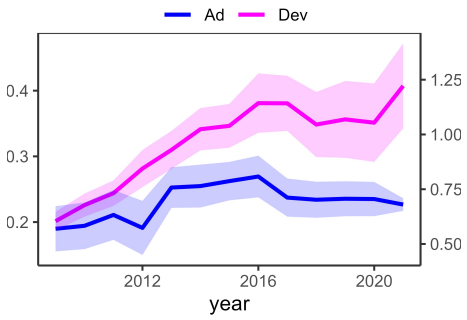
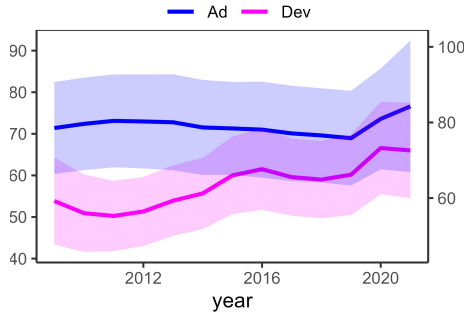
Figure 5: Loans per 1,000 adults



Note: Loan per 1,000: cross-country average of the sum of borrowers from commercial and non-banks divided by total adults; dev: developing or emerging economies; Ad: advanced economies; shaded areas: (+/-) cross-country standard deviations.

Figure 6: Loans to GDP



Note: Loan to GDP: cross-country average of outstanding loans from commercial banks (% of GDP); dev: developing or emerging economies; Ad: advanced economies; shaded areas: (+/-) cross-country standard deviations.

SRISK and Macroprudential Regulation

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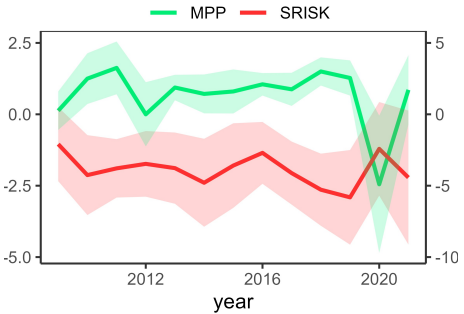
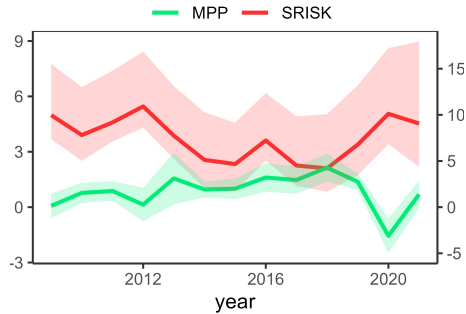
Figure 7: Developing and Emerging Economies



Note: SRISK: cross-country average of SRISK in US$bn; MPP: cross-country average of MPP, i.e. sum of six monthly dummy-type indicators of tightening and loosening of macroprudential policy instruments; shaded areas: (+/-) cross-country standard deviations.

Figure 8: Advanced Economies



Note: SRISK: cross-country average of SRISK in US$bn; MPP: cross-country average of MPP, i.e. sum of six monthly dummy-type indicators of tightening and loosening of macroprudential policy instruments; shaded areas: (+/-) cross-country standard deviations.

Data Sources

Table 1: Bank-Level Variables: Descriptions and Sources

Variable	Description	Source
SRISK	Bank's contribution to systemic undercapitalization, log US$bn	NYU V-Lab
Z-Score	Insolvency risk: $-1(\text{ROA} + \text{Equity to Assets})/\sigma(\text{ROA})$	Bloomberg
CDS (Idiosyncratic)	Residuals from PCA on CDS spreads and country stock price volatility	Bloomberg
MIC	Average deviation to minimum Basel III ratios: leverage, Tier 1, Liquidity coverage ratio, Net stable funding ratio	Bloomberg
MICCred	Cumulative change in MIC $\times$ cumulative change in Loans to GDP (CB+NCB)	Own
Bank Controls	Total assets (log US$ bn), ROA, equity to assets	Bloomberg

Data Sources

Table 2: Macro-Level Variables: Descriptions and Sources

Variable	Description	Source
Loans to GDP	Credit inclusion: loans as % of GDP	FAS (IMF)
Loans per adults	Borrowers per 1,000 adults	FAS (IMF)
Deposits to GDP	Deposits as % of GDP or per adult	FAS (IMF)
Competition	-1 x 3-bank asset concentration index, inverse proxy	WBGFD
Debt Service	Household debt service to income ratio	OECD
NCB Share	Loans/deposits by non-commercial banks (% total)	FAS (IMF)
MPP	CCyB, capital conservation, other capital requirements, limits on leverage, liquidity and foreign exchange exposures	iMaPP (IMF)
MPPCred	Cumulative MPP $\times$ cumulative change Loans to GDP (CB+NCB)	Own
Macro Controls	GDP growth, capital equity flows (net inflows, % GDP), deposit interest rates, stock price volatility	WB, WBGFD
Dev & Adv	Developing and Emerging Economies & Advanced Economies[5]	IMFWEO

[5]Dev: Brazil, Colombia, India, Indonesia, Malaysia, Mexico, Philippines, Saudi Arabia, South Africa, Thailand, United Arab Emirates, Vietnam. Ad: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Israel, Italy, Japan, Norway, Singapore, Spain, Sweden, Switzerland, United Kingdom and United States.

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